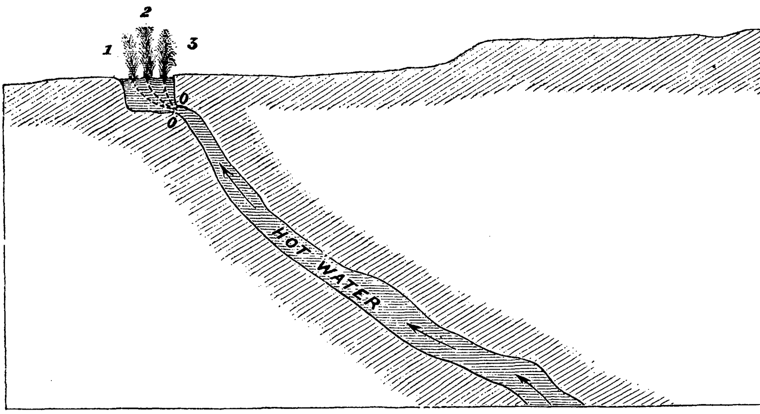
or cliff, he informs me, is of quartzite (Potsdam sandstone), which has the curve of an anticlinal axis, the base of which may be called a cave. This is arched, high enough for a man to stand at the entrance, with the roof declining backwards and on each side to the ground; the width and depth about twelve feet. The "find" of specimens consists of one hundred and thirty arrowheads, of quartz, jasper, limestone, and chalcedony; one banner-stone or sceptre, a perforated implement resembling a tomahawk; eight chisels, mostly of quartz; two pipe-stems, three net-sinkers, and about one hundred fragments of pottery. As the characteristic specimens of this find, with full details of their discovery, will shortly be illustrated and described, we will not refer more particularly to them. The specimens here briefly referred to were found beneath a deposit of rich black mold, varying from two and one half to three feet in depth. If this deposit is solely due to the decomposition of vegetable matter, the contained relics indicate that very far back in the past the red man had arrived at an advanced stage of neolithic culture; for the specimens as a class are of excellent workmanship. — CHARLES C. ABBOTT, M. D.

THE TASMANIANS. — In a recent memoir on the osteology and peculiarities of the Tasmanians, who have recently become extinct, Dr. J. B. Davis records his belief that they represent a type distinct from the Australians. Besides presenting osteological differences, the Tasmanians never used the boomerang or shield, although they had a larger brain, and were intellectually superior to the Australians. Like the Australians, however, the Tasmanians never made pottery. Although Tasmania is situated but a little more than three hundred miles from Australia, Davis thinks there was never any communication between the two peoples. In confirmation of this view he states that the Tasmanians neither had native dogs nor practiced circumcision, a custom very general among the Australians. "All that can be said with truth is that the Tasmanians are not Australians, they are not Papuans, and they are not Polynesians. Although they may present resemblances to some of these, they differ from them all substantially and essentially. From all this we are justified in asserting that the Tasmanians were one of the most isolated races of mankind which ever existed; that they were a peculiar and distinct race of people, dwelling in their own island, and different from all others. And they have been one of the earliest races to perish totally by coming into contact with European people." The population of Tasmania at the time when first visited by Europeans was between four thousand and seven thousand. The last native died three years since.

GEOLOGY AND PALÆONTOLOGY.

HOT SPRINGS AND GEYSERS. — We extract from Prof. T. B. Comstock's Report on the Geology of Wyoming the following remarks on the difference between hot springs and geysers: "In the ordinary hot

spring the spurting of the liquid, when it occurs, is owing to a resistance offered to the direct escape of the expansive force from below, and this resistance may be found in the tenacity of the liquid contents of the bowl, in the untoward shape of the bowl or its connected passages, or in the sudden restriction of the orifice near the surface of the liquid. In either case the uprising force is condensed, as it were, near one point, and the spurt or eruption is caused by the sudden overcoming of the tension when the force has become sufficiently concentrated to free itself from its confinement. Thus we may meet with a great variety of spouting thermal springs, resulting from two or more of these causes combined, and the force may be produced by heat alone or by the evolution of carbonic acid or other chemical change in addition. (See Figure 14.)

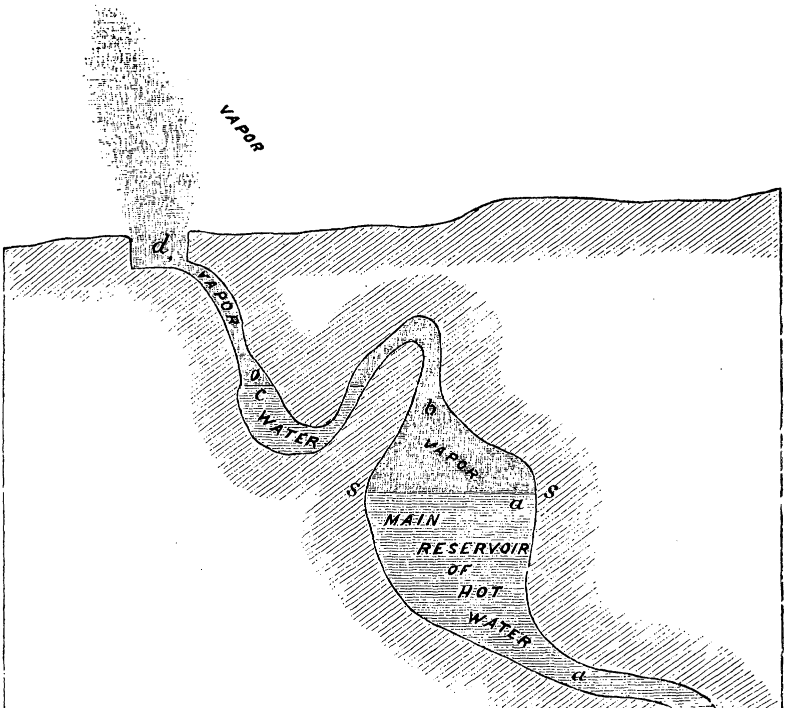


(FIG. 14.) IDEAL SECTION OF A THERMAL ERUPTIVE SPRING.

The arrows represent the direction of the action of the subterranean force. The channel is constricted at *o o*, the entrance of the surface bowl; 1, 2, 3 represent the variable position of the successive jets.

"The phenomena observed in connection with the typical geyser, however, do not admit of such a simple explanation; and there is much doubt whether existing theories are sufficient to account for all the common manifestations of such agitated bowls. Almost without exception, in the true geyser, the action, whether frequent or the reverse, is intermittent, although the successive periods in each case may be quite irregular. Usually, as the first indications of an approaching eruption, there will be noticed an escape of vapor, soon followed by a sudden rising of a mass of water sufficient to fill the surface-chamber of the geyser. The phenomena which follow are very largely the result of structural features of varying nature, no doubt, but it will invariably be found that the eruption takes place near the centre of the bowl, and that the elevation of the column of water is accomplished by continuous or successive throes from one spot, while in the ordinary eruptive springs the column is seldom shot upward from the same point twice in succession. We

must, therefore, believe that the propelling power in the geyser acts temporarily and suddenly, while in the common hot spring, quiet, boiling, or eruptive, constant or periodical, the force is evolved with considerable regularity. The idea which the writer desires to convey will be rendered more evident by the comparison of Figures 14 and 15. Figure 14 shows the supposed section of a common eruptive spring; and it will readily be seen that jets may even occur in cold springs of this structure, provided a quantity of carbonic acid or other gas is struggling to free itself from beneath the ledge at *o*. In Figure 15, which is intended to represent the



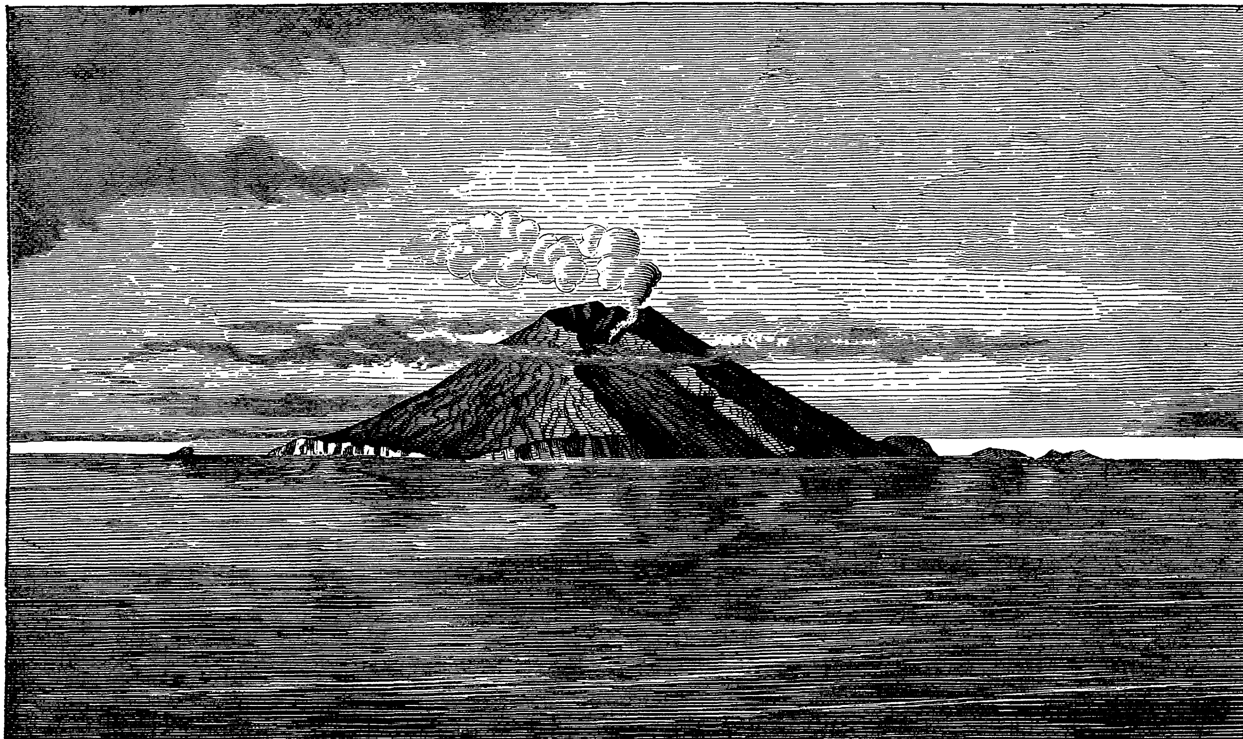
(FIG. 15.) IDEAL SECTION OF AN INTERMITTENT GEYSER.
To illustrate the phenomena of eruption during the escape of vapor, prior to the ejection of hot water.

supposed condition of the subterranean geyser-waters in the first stage of an eruption, the reservoir *a* is supposed to contain water which remains in equilibrium nearly at the level *ss*. By constant accessions of heat from below, the vacant passage above is finally filled with vapor, and by degrees the water in the bent passage *c* becomes heated, and evolves vapor also, as in *o*. After a time, the expansion of the vapor in *b* is able to overcome the combined pressure of the water and vapor in *c* and *o*, when the latter is forced out, followed by a portion of the water in the reser-

voir *a*. The force thus expended, a vacuum is produced in *b* by the receding of the column of water in *a*, and the foregoing operations are indefinitely repeated. This theory seems capable of explaining the facts so far as they are known, and the variations observed in special cases, or even in different eruptions of the same geyser, appear to the writer to require but slight modifications of the section, and none that are of great importance. The passage *c* may be kept filled with water by means of the surplus which falls back into the bowl.

"Bunsen's theory of geyser action, which has not yet been proven inadequate to explain the more prominent features of eruptions, does not seem sufficient (to the writer) to account for all the differences between the geyser and the mere hot spring, but it must not be inferred that such excellent authority is disregarded. On the contrary, the author proposes the structural hypothesis simply as a supplement to the superheating theory of Dr. Bunsen, in order to explain surface phenomena common in the Fire-Nob basins, which appear to require an extension of his views. At the same time it must be confessed that there are objections to his theory, based upon these observations, which are difficult to reconcile. It will be impossible to present these here, but an outline of the theories in question is appended. Bunsen has shown that an eruption may be artificially produced by introducing steam near the base of a long, narrow column of water, which causes the water, as it rises under pressure, to become super-heated, the surplus heat being used for the production of more steam, which adds to the elevating force. This admirable theory, of which the above experiment is an illustration, is based upon a series of ingenious observations among the hot springs of Iceland. Bischof adopts an opinion almost identical with the structural hypothesis here proposed, and the present author, it will be remarked, combines the two theories, believing both necessary to explain all the facts observed."

THE MECHANISM OF STROMBOLI. — As apropos to the subject of geysers we would direct the reader's attention to an able article on Stromboli by the late G. Poulett Scrope, published in the *Geological Magazine* for December, 1874, and illustrated by a view of Stromboli, which is here reproduced (Plate I.) through the courtesy of the publishers, the Messrs. Trübner & Co. Mr. Scrope attacks Mallet's suggestion that the mechanism of Stromboli has not merely some similarity with that of a geyser, but that the volcano actually contains a geyser in its inside. In this connection he quotes Lyell's Principles, in which it is stated that the phenomena of geysers "have no small interest as bearing on the probable mechanism of ordinary volcanic eruptions, namely, that the tube itself is the main seat or focus of mechanical force." Scrope then refers to his own theory, which corresponds to the views of Lyell and Dana. The opinion of the latter he quotes as that "of an impartial and unquestionable authority" (Dana's Manual, 1863, page 692). Mr. Scrope shows that "there is no ground whatever for attributing to Stromboli any mechanism different from that of ordinary volcanoes."



STROMBOLI VIEWED FROM THE NORTH. (*After* ABICH.)

THE MOUNTAINS OF NEW ZEALAND. — In the coast scenery of New Zealand, with its deep fiords and mountains, none of which, however, rise above an elevation of nine or ten thousand feet, we find some interesting similarities to the scenic features of the Pacific coast of Oregon and Alaska. An interesting account of the physical geography of New Zealand, particularly the province of Otago, is given by Messrs. Hutton and Ulrich in their Report on the Geology and Gold Fields of Otago. The sounds or fiords were in one case found to be 1728 feet in depth. Mr. Hutton notices the points of difference between the Alps of Switzerland and those of New Zealand. "No one," he says, "after visiting the Alps of New Zealand, could fail to notice two remarkable points of difference between these mountain regions. The one is that mountains with sharp, serrated summits, which are the exception in Switzerland, are the rule in New Zealand, and the other is that the numerous large waterfalls which the traveler in Switzerland sees at almost every turn are quite exceptional in New Zealand. A few waterfalls, but they are very few in comparison with Switzerland, are found in the deep fiords on the west coast, and a few smaller ones towards the heads of the valleys in the heart of the mountains, and these are nearly all. And yet the mountains in New Zealand are quite as rough and rugged as the Alps of Europe, and indeed the gorges are more numerous and deeper. There are also other minor points of difference."

GEOGRAPHY AND EXPLORATION.

CAMERON'S EXPLORATIONS IN TROPICAL AFRICA. — Cameron's achievement stands quite alone. For the first time in the history of the world a European traveler has walked across tropical Africa from east to west. But Cameron has done more. This wonderful march of three thousand miles is but a portion of his work. He has taken such a series of scientific observations as will place him in the foremost rank of practical geographers; he has surveyed the southern half of the great Lake Tanganyika, has solved the problem of the course of the Congo, and has fixed the position of the water parting between the Congo and the Zambesi.

Born in 1844, and having entered the navy in August, 1857, Lieutenant Cameron was only twenty-eight when he received his instructions from Sir Bartle Frere at Zanzibar, and took command of the Livingstone East Coast Expedition. His previous services, which qualified him for this important charge, are recorded at page 274 of *Ocean Highways* for December, 1872. His instructions, dated February 14, 1873, were to take up supplies to Dr. Livingstone, and to carry out such exploration as he might direct or advise, it being specially pointed out that the completion of the survey of Lake Tanganyika was work of great importance. Accompanied by his friend and old messmate, Dr. Dillon,